Natural Resource Information Division

RESOURCE KNOWLEDGE

Inventory and monitoring (I&M) are among the most basic tools that enable resource managers to establish baselines and measure change. Data gathered through I&M activities help counter threats and substantiate resource management, improving our effectiveness and credibility as resource stewards. We saw progress in this area in 1996 with many parks collecting and analyzing data and taking action on various problems. The national I&M Program also progressed as some parks were finally able to begin staffing their I&M operations; however, this program is well behind in its timetable to bring all prototype monitoring parks up to speed, due to limited funding.

Inventory and monitoring in the national park system

by Gary Williams

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With a mission to conserve the natural and cultural resources and values of the national park system unimpaired for the enjoyment of this and future generations, the National Park Service has an awesome responsibility. We are currently unable to attain this mission, owing to a serious lack of scientific information about the nature and condition of resources in many parks. In addition, we typically lack the expertise needed to monitor resource conditions over time and formulate management strategies to deal effectively with the myriad threats and issues impacting those resources.

To address this general lack of credible information and monitoring expertise, Congress funds the Inventory and Monitoring (I&M) Program of the National Park Service. This program coordinates systematic efforts to acquire 12 basic data sets for each of the more than 250 parks with significant natural resources. These inventories include an automated, historical database (bibliography); park surveys of vascular plants, vertebrates, threatened and endangered species, and other species of special concern; vegetation, geologic, and soils maps and cartographic data; water resource inventories; air quality information, including air quality-related values; and basic precipitation and meteorological data. Collectively, these data sets represent the minimum scientific information needed to manage park natural resources.

In addition to the resource inventories, the I&M Program also establishes prototype long-term ecological monitoring programs in parks. These programs develop and test cost-effective methods for monitoring park ecosystem status and trends over time and formulate management strategies to cope with threats. Both the resource inventory and long-term monitoring efforts are assisted by the USGS Biological Resources Division and other federal agencies.

The I&M Program has made substantial progress in completing park resource inventories and initiating prototype monitoring programs. Through 1996, bibliographic databases have been funded for 256 parks, existing park species information has been validated for approximately 95 parks, and base cartographic data sets have been acquired for 130 parks. Vegetation mapping is under way in 32 parks and soils mapping in 21 parks. In addition, 7 prototype long-term monitoring programs have been initiated, with 4 other such programs selected for design.

An estimated additional $75 million will be needed to complete the resource inventories and fully implement the 11 prototype monitoring programs. At current funding levels, nearly 20 years will be required to complete all of these projects. Lack of future funding could jeopardize our ability to protect natural systems in a timely manner.

A scientist gathers forest health data, *Sequoia National Park, California.*

Geographic Information Systems

GIS comes of age

by Leslie Armstrong

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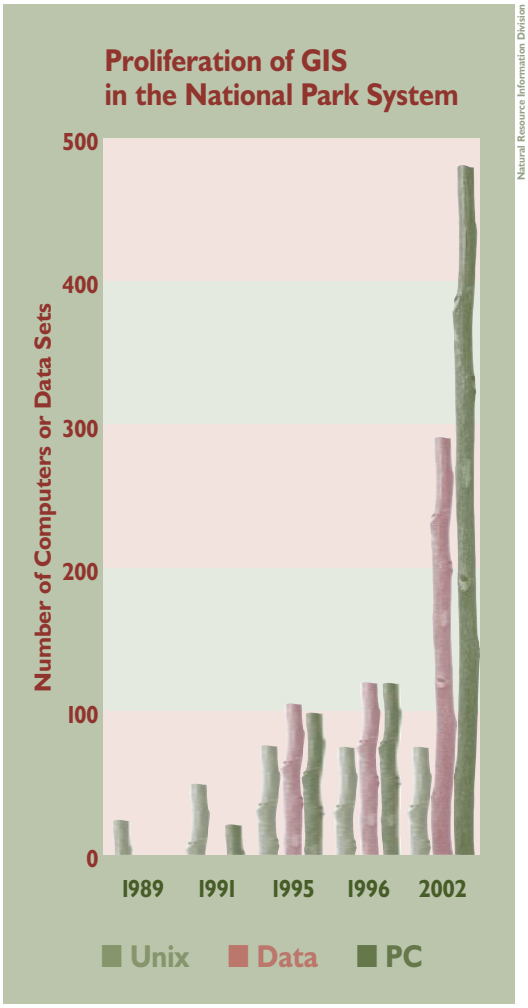
More parks than ever used Geographic Information Systems (GIS) in 1996 to convey and create new information in support of park management. Among those uses were map publication, fire management, park planning, and data integration and analysis. The development, growth, and decrease in costs of desktop (personal computer) GIS, park data availability, and the ability of the National Park Service to provide technical support to parks using GIS is revolutionizing the way parks work with information.

GIS has become easier to use recently with the introduction of ArcView™ software. ArcView™ allows users to view, map, integrate, and analyze information on a personal computer (PC). The introduction of ArcView™ is partly responsible for the increased use of GIS in parks, including all parks in the National Capital and Alaska Regions and the Columbia-Cascades Cluster. The use of ArcView™ over a parkwide computer network with a computer that provides data is the latest GIS trend called "distributed GIS." This enables any park staff using a network-connected computer to access GIS tools and a variety of park data. For example, Sequoia-Kings Canyon National Park has 10 ArcView™ licenses available on their network with 10 more planned in the near future.



The contrast between the current desktop units and older systems is striking. Mainframes and UNIX workstations were once the only option for GIS, and somewhat of a nightmare for parks. The systems were expensive, difficult to use and maintain, and required a full-time GIS specialist. However, GIS has evolved into an inexpensive, user-friendly desktop tool that can be used by trained park staff, not just the GIS specialist. Although approximately 67 UNIX GIS systems still exist in the national park system, they are mostly located at larger parks and the nine GIS Field Technical Support Centers where greater support for these systems usually exists.

Should parks need support, they can rely on the Field Technical Support Centers (FTSCs) to do the heavy computing required for database construction and complex analysis and modeling. This allows parks to focus their use of GIS on projects and management issues. Additionally, FTSCs are a source of GIS training and consultation in resolving problems or questions. They also coordinate funding, implementation, and data acquisition such as vegetation mapping.

In 1996, new GIS funding in the amount of $800,000 provided a head start for two new FTSCs—at Hawaii Volcanoes National Park and the University of Rhode Island. This budget also allowed further development of the seven existing centers at the University of Wisconsin—Madison, North Carolina State University, University of New Mexico, National Capitol GIS FTSC, NPS—Denver, Alaska GIS Division, and Columbia-Cascades/Pacific Great Basin—Seattle. These centers currently support about 156 parks with a target implementation of approximately 258 parks that have GIS needs. The proliferation of GIS in recent years is certainly a good sign for science-based park management.

I&M Program accomplishments for 1996

by Gary Williams

Cape Cod National Seashore

- Established a cooperative agreement with the USGS Biological Resources Division through the University of Rhode Island
- Established a technical oversight committee for the monitoring program
- Initiated efforts to hire a full-time I&M coordinator

Channel Islands National Park

- Hosted inventory and monitoring training course for 30 NPS natural resource specialists
- Assisted Point Reyes National Seashore and Golden Gate National Recreation Area in the development of an ecological monitoring program

Denali National Park And Preserve

- Hired both a full-time coordinator to manage the overall prototype monitoring program in the park and a term-appointment physical science technician with expertise in glacier and weather monitoring
- Strengthened the conceptual framework of the monitoring program through two workshops that improved program objectives; developed solid linkages between management needs and information gained through monitoring; discussed expanding the current watershed focus to include a multiscale program that would discern ecosystem change at several spatial and temporal scales
- Field-tested techniques for monitoring glaciers with final protocols expected by fiscal year 1998.

Great Smoky Mountains National Park

- Began to mesh monitoring studies for acid deposition and water quality, aquatic macroinvertebrates, and fish
- Sought external funding that is providing major inventories in neotropical migratory birds, spiders, and other biologically diverse groups

Prairie Park Cluster

- Documented a significant decline in stream water quality at Wilson's Creek National Battlefield, Missouri, and will use monitoring results to help prevent placement of an additional sewage treatment plant in the Wilson's Creek watershed

Shenandoah National Park

- Documented tremendous recovery capability of fish populations following the floods of 1995; large numbers of fish were found in sections of streams where almost 100% of the fish were absent immediately following the floods in the previous year
- Revealed through monitoring that visibility in the park improved in 1996, probably the result of higher than normal rainfall
- Revised fisheries monitoring protocols to standardize data collection for all species and for data comparability with Great Smoky Mountains National Park

Virgin Islands National Park

- Initiated efforts to hire full-time I&M coordinator
- Initiated efforts to hire an administrative assistant and two biologists; initially to be BRD employees, staff will be transferred to the Park Service when the program becomes fully operational

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Resource managers monitor *prairie forb establishment at Wilson's Creek National Battlefield, Missouri.*

Prairie Cluster Monitoring Program

Air resources

New ozone standards and the NPS monitoring network

by David Joseph

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Since the early 1980s, the National Park Service has monitored the levels of the air pollutant ozone at many parks. Ozone monitoring is important to the National Park Service because ozone is particularly poisonous to vegetation, and ozone levels measured in many parks exceed threshold levels above which vegetation injury may occur. In December 1996, the U.S. Environmental Protection Agency (EPA) proposed new ozone air pollution standards that are designed to protect humans and vegetation from the effects of the pollutant. What is the significance of these new standards to the National Park Service? The data collected in our ozone monitoring network have helped answer this question.

Based on the most recent data collected in the network over a three-year period, at least eight parks are out of compliance with the proposed EPA "primary" standard to protect human health: Cape Cod National Seashore, Cowpens National Battlefield, and Great Smoky Mountains, Joshua Tree, Sequoia-Kings Canyon, and Shenandoah national parks. As illustrated in the map, at least 11 parks also do not meet the proposed "secondary" standard that EPA has suggested would protect park resources from the adverse effects of ozone. States that have areas in "nonattainment" of these national ambient air quality standards must design and enforce air pollution control programs to decrease the amount of ozone in the air to levels below the standards.

More parks may fail to meet the proposed EPA ozone standards than the ones indicated in the illustration; only parks with ozone monitors were included in this analysis. If more areas had monitors, we would likely have determined that additional parks were out of compliance with the proposed standards. Our ability to monitor at new and existing sites has been seriously compromised over the last six years. Since 1991, our network of long-term air quality stations has shrunk from 42 to 33. Increasing operational costs without accompanying budget increases for monitoring accounted for these shutdowns. These developments jeopardize our ability to maintain long-term monitoring networks necessary to assess the conditions of, and trends in, air quality in national parks. Further reductions in the long-term monitoring network likely will continue as a result of government downsizing and our inability to replace some aging and outdated monitoring equipment. However, a proposed FY98 budget increase would offset increased monitoring costs.

Based on air quality monitoring data *collected from 1993–95 in these units of the national park system, 11 parks did not meet the newly proposed EPA ozone secondary standard.*

Source: 1993–95 NPS and state data.

▲ Site did not meet EPA proposed ozone standard at least once in 1993–1995

● Site met EPA proposed ozone standard in 1993–1995

Wildlife and vegetation

The information link to preserving endangered species

by Peggy Olwell

Because only a few individuals exist in a few populations, endangered species are inherently difficult to manage. This problem is exacerbated by a lack of knowledge of the locations and numbers of endangered species on park lands. Consequently, NPS management decisions relating to endangered species must often be made with incomplete information. For example, a trail crew lacked information on the whereabouts of a rare paintbrush *(Castilleja)*, which resulted in the loss of the population when the trail was widened. On the other hand, Sneed's Pincushion Cactus *(Coryphantha sneedii var. sneedii)* occurred in larger populations and more localities than was known before a survey, and the species was taken off the list of endangered species. As these examples indicate, lack of endangered species information has a bearing on both the level of protection achieved in the field and the management energies expended on species preservation.

To help counter the information deficit, the National Park Service signed a cooperative agreement with The Nature Conservancy in September 1996 to develop a national database on federally listed, candidate, and globally rare plants and animals occurring or potentially occurring on park lands. The project will involve a cooperative effort between The Nature Conservancy, the National Park Service, and state heritage programs to determine the best initial sources of information, develop data sets for each park, and review and reconcile the data. This joint project will produce a database on reported or potentially occurring nationally significant plant and animal species, their federal and state endangerment status, and their domestic and international distribution. It will also detail the units in the national park system that report the same species.

Swamp Pink

'Ahinahina or Silversword

Snail Kite

In addition to local-level information, the National Park Service will gain a national picture of endangered species on park lands. This will enable us to determine our responsibilities under the endangered Species Act, seek funding for the preservation of Endangered species on park lands, and determine those parks that need to be inventoried for endangered species and those species that need to be monitored. This information will help the National Park Service avoid losing populations of any endangered, threatened, or significantly rare plants and animals.

Unfortunately, lack of information is not the only problem we face in caring for endangered species. In 1995, expenditures for the recovery of endangered species in the national park system hit an all time low at $2.6 million dollars; this development further hampers our ability to properly care for endangered plants and animals.

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Highly vulnerable to destruction, *the Tennessee purple coneflower* (Echinacea tennesseensis) *grows in shady cedar glades. The plant's habitat in an area undergoing rapid residential development.*